Alexander Steele

Software Engineer · UBC Computer Science and Physics

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Experience

Tesla, Inc.
Palo Alto, California

Crash Safety Software Engineer Intern
September – December 2022, May – August 2023

- Designed and wrote SPI drivers to control the restraint control module's (RCM) inertial measurement units (IMUs) in **C**.
- Implemented numerical integral approximations for the RCM crash algorithm's near-deploy calculations in **C**.
- Created chip-level software-in-the-loop (**SIL**) models for the RCM's onboard IMUs with extensive fault-injection capabilities in **Rust** and **PyO3** and wrote SIL tests for drivers and crash algorithm using **PyTest**.
- Reduced hardware-in-the-loop (**HIL**) test execution time from 5.5 hours to 2 minutes and enabled the addition of the HIL test suite to continuous integration (CI) by automating test running using **Python** and **C**.

University of British Columbia
Vancouver, British Columbia

Lead Undergraduate Teaching Assistant
January 2020 – Present

- Maintains **Racket** autograder server used by over 800 students to submit and receive feedback on over 1500 files daily.
- Improves students' engagement by providing personalized feedback using applications developed in **Python** and **Bash**.
- Detected over 200 cases of academic misconudct by designing, implementing, and deploying novel code-similarity algorithm using **Rust**, **Python**, and **TensorFlow**.
- Supervises three other teaching assistants who contribute to the course infrastructure and teaching materials.

UBC Department of Computer Science
Vancouver, British Columbia

Numerical Methods Research Assistant
May 2022 – August 2022

- Created novel discretization technique for solving ill-conditioned instances of Helmholtz equation in **MATLAB**.
- Developed high-performance magnetohydrodynamic finite-element simulation software using **C++** and **Eigen**.
- Optimized the performance of simulations with millions of degrees of freedom using knowledge of vector calculus.

Kepler Communications
Toronto, Ontario

Software Engineer Intern
January 2021 – August 2021

- Architected and created drivers and a multithreaded application for the display and keypad on Kepler's next-generation modems using **Python**.
- Singlehandedly developed new remote software image deployment system capable of supporting the growing number of models in Kepler's constellation of 19 satellites using **Python** and **SQL**.

UBC Rocket
Vancouver, British Columbia

Senior Avionics Team Member
January 2020 – Present

- Leads development of onboard and ground station software used across numerous rocketry projects to control the functioning of flight-critical and data collection electronics.
- Designed **Qt**-based ground station application in **Python**, using **Matplotlib** for real-time maps and time-series plots.
- Implemented automated **SIL** integration testing suite, to ensure that arming signals would be properly sent from the ground station and acted upon by the firmware, using **PyTest**.
- Saved months of engineering time at the start of each new competition by leading effort to ensure ground station compatibility across differing rocket hardware platforms.

Skills

Languages	Python, C, C++, Rust, Java, MATLAB, Julia, Racket, Kotlin, C#
Technologies	Git, PyTest, Qt, Django, Flask, Scientific Python, TensorFlow, LaTeX, Bash, CMake, GDB
Technical	Object-Oriented Design, Agile Methodologies, Test-Driven Development, SIL Testing, Data Analysis

Education

University of British Columbia
Vancouver, British Columbia

B.Sc. Combined Honours Computer Science and Physics
September 2019 – April 2024

Major average of 96.5% (4.0/4.0 GPA equivalent)

Projects

Fëanor: MSP430-Based Quadcopter
January 2022 – April 2022

- Designed and assembled a quadcopter using both stock and 3D-printed components.
- Developed real-time flight-controller software for the TI MSP430 microcontroller, working within its limited 512 bytes of RAM, 16 kilobytes of storage, and 1 MHz clock speed, using **C** and **Assembly**.
- Implemented a proportional–integral–derivative (PID) controller to adjust thrust patterns in response to accelerometer readings to maintain stable flight for over 90 seconds.

Lance: Reinforcement Learning for Competitive Pokémon (GitHub)
July 2021 – Present

- Created a simulator for Generation I Pokémon battles using **Python**.
- Implemented support for interfacing with both human and computer agents.
- Trained NEAT agents capable of playing a simplified version of the game optimally using self-play.
- Extended the NEAT-Python library to add a **multiprocessing**-based evaluator capable of self-play.

Beorn: Game Boy Emulator
January 2023 – Present

- Implemented cycle-accurate emulation of the Zilog Z80 CPU and Game Boy hardware using **C++**.
- Programmed desktop frontend using Simple DirectMedia Layer (**SDL**) and Discord frontend using **pybind11** and **Python**.

Poor Man's 4090: Ray-Tracing Rendering Engine (GitHub)
November 2022

- Implemented multithreaded ray tracer using **Rust**, with Rayon for thread pools and nalgebra for vectorized computations.
- Reduced render times in dense scenes by 95% by optimizing collision detection using bounding volume hierarchies.

Au Delà: Natural Language Processing for CS Education (GitHub)
January 2022

- Interfaced with OpenAI's GPT-3 Davinci Codex autoregressive natural language and source code model to provide AI-powered tools for educators and students in computer science.
- Created suite of AI-powered tools for computer science educators and students by interfacing with OpenAI's GPT-3 Davinci Codex autoregressive natural language and source code model.
- Won "Best Use of GPT-3 API" sponsor prize from OpenAI at nwHacks 2022.

UBC Course Monitor (GitHub)
July 2020 – August 2020

- Developed a web application to monitor the University of British Columbia's Student Services Centre for open seats in courses in **Python** using **Django** with a **Celery** task queue.
- Built a web scraper to determine a course section's status using the Requests HTTP library, the BeautifulSoup HTML parser, and **regular expressions**.
- Designed accessible frontend using Django templates and **Bootstrap**.
- Deployed application on **Heroku** using a **PostgreSQL** database and **Redis** cache.

Honours & Awards

Dorothy Gladys Studer Memorial Scholarship
October 2022

Received "on the recommendation of the Department of Physics" for being "the student who [obtained] the highest standing in the third year courses in Honours physics and who is proceeding to the final year of the program."

Computer Science Scholarship
October 2022

Received "on the recommendation of the Department of Computer Science, largely on the basis of academic standing."

Accenture Leadership Award
May 2022

Received for "[achieving] high academic standing, [demonstrating] leadership, and [participating] actively in extra-curricular or volunteer activities."

Trek Excellence Scholarship
August 2020, August 2021, September 2022

Received in first, second, and third year for placing in the top 5% of students in current year and faculty.

Science Scholar/Dean's Honour List
2020, 2021, 2022, 2023

Received for maintaining an average of 90% or higher in the 2019, 2020, 2021, and 2022 Winter Sessions.